NAIC-ID(RS)T-0413-94

NATIONAL AIR INTELLIGENCE CENTER

BRIEF INTRODUCTION TO STATE KEY PHYSICS LABORATORIES AND DIVISION OPEN LABORATORIES (I)

HUMAN TRANSLATION

NAIC-ID(RS)T-0413-94 22 December 1994

MICROFICHE NR: 94C000586

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English pages: 12

Source: Wuli, Vol. 20, Nr. 1, January 1991; pp. 53-56

Country of origin: China
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F33657-84-D-0165
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Requester: NAIC/TATA/J.M. Finley

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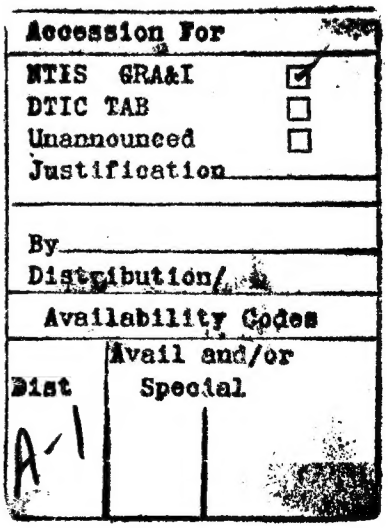

BRIEF INTRODUCTION TO STATE KEY PHYSICS LABORATORIES AND DIVISION OPEN LABORATORIES (I)

This is a brief introduction of some of the State Key Physics Laboratories and divisional open laboratories. The laboratories to be discussed are those whose operations have been evaluated in 1990 by The Committee of the National Science Foundation, division of mathematics and physics. The evaluation was authorized by The National Science & Technology Committee.[1] Since the evaluation reports were not submitted in an unified format, the style of this article also varies from place to place.

Table 1 lists the labs to be discussed.

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[1] Other related State Key Physics Laboratories and division open labs will be covered later. For those labs which have already been discussed in this journal, the article will only give brief supplemental information-editors' note.

Table 1. The State Key Physics Laboratories and Division Open Labs

Category	discipline	lab name	director	head academic committee	address
State key labs	condensed state physics	lab for solid microstructure physics	Feng Duan	Feng Duan	Nanjing 210008 Nanjing University
		crystalline material lab	Jiang Minhua	Jiang Minhua	Jinan 250100 Shandong Univ.
		surface physics lab	Wang Ding-sheng	Xie Xide	Beijing 100080 Physics Institute, Academy of Sciences of China
		lab for semi-conductor super crystal lattice	Zheng Houzhi	Huang Kun	Beijing 100083 Institute of Semiconductor, Acad. Sci. China
	atomic & molecular physics	lab for spectra, atomic & molecular physics	Ye Chaohui	(Wang Tian-quan)	Wuhan 430071 Wuhan Institute of Physics, Acad. Sci. China
	optics	applied optics lab	Mu Guoguang	Wang Daheng	Changchun 130022 Changchun Ins. of Optics & Fine Mechanics, Acad. Sci. China
		lab for ultra-fast laser spectra	Yu Zhenxin	Gao Zhaolan	Guangzhou 510275 Zhongshan Univ.
Division open labs	condensed state physics	lab for solid atom image	Ye, Henqiang	Guo Kexin	Shengyang 110015 Shengyang Ins. of Metal, Acad. Sci. China
		Beijing electron microscope lab	Guo Kexin	Guo Kexin	Beijing 100080 Factory of Scientific Instruments, Acad. Sci. China
		lab for internal	Ge	He	Heifei 230031

Table 1 continued.

	combustion	Tingshui	Yizhen	Ins. of Solid Physics, Acad. Sci. China
	lab for structure analysis	Zhang Yuheng	Qian Linzhao	Heifei 230026 Chinese University of Sci. & Tech.
	magnetics lab	Zhan Wenshan	Zhang Zhong	Beijing 100080 Ins. of Physics, Acad. Sci. China
optics	lab for laser spectra	Liu Songhao	Wang Daheng	Heifei 230031 Anhui Ins. of Optics & Fine Mechanics, Acad. Sci.China
	lab for high power laser physics	Deng Ximing	Yu Min	Shanghai 201800 Shanghai Ins. of Optics & Fine Mechanics, Acad. Sci. China
	lab for quantum optics	Wang Yuzhu	Wang Zhijiang	The same as above
	lab for applied research in single atom detection by lasers	Chen Dieyan	Wang Daheng	Beijing 100084 Hsinghua Univ.
acoustics	modern acoustics lab	Wu Wenzha	Wei Rongjue	Nanjing 210008 Nanjing Univ.
nuclear physics	ion-beam lab	Zou Shichang	Zou Shichang	Shnghai 200050++Shanghai Ins. of Metallurgy, Acad. Sci. China
	lab for heavy-ion physics	Chen Jiaer	Hu Jimin	Beijing 100871 Beijing Univ.

A. State Key Labs

LAB FOR SOLID MICRO-STRUCTURE PHYSICS

Lab director: Feng Duan
Associate director: Min Naiben
Head of academic committee: Feng Duan
Address: Nanjing 210008, Nanjing University
Phone: 634451-2756

The Lab for solid micro-structure physics of Nanjing University is among the first batch of the state key labs established in our country. The preparations for establishing the lab were approved in 1984, and the lab passed the state appraisal in October, 1987. Its academic committee was formed in Oct., 1985 and the lab has been open to both outside domestic and foreign researchers since then.

a. Directions of research

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The study of solid micro-structures is not only an important direction of basic research in solid state physics, but also an important interface between physics and material science. The research goals of this lab are to study, at atomic and molecular levels, the configuration, distribution and interactions of solid micro-structures of different level and type, as well as the rules of their formation and transformation; to elucidate the impact of micro-structure on various physical properties; to carry out molecular and micro-structure design of material on the basis of the above studies; and to prepare novel materials with predicted micro-structure and superior properties through various modern technological processes.

b. Goals of research

It was planned to continue the research in defect physics and physics of phase transitions in the near future, to establish experimental techniques and methods for the required preparation, observation and measurement, to develop theoretical methods and computer simulations of solid micro-structures, to thoroughly understand the relationship between micro-structure of materials an their properties in order to control and utilize solid micro-structures. It was planned to put emphasis on basic research and to expand applied basic research as the work proceeds. The emphasis of material research will also be broadened from polylayer multiple domain crystal to super crystal lattice of metals, super crystal lattice of crystalline semiconductors, material of super fine particles, high critical temperature superconducting material, liquid crystal material, polymer material and soluble-gel crystals. The ultimate goal is to make a breakthrough in the design, preparation and property control of the non-classic solid materials. It will not only contribute to progress in the field of solid micro-structures, but also have a positive impact on our nation's economy. This lab has united with the crystal materials lab of Shandong University which makes it possible for their research areas and experimental capacities to cover solid state physics, solid state chemistry and material science. They also proposed an alliance with other state key labs in condensed state physics and related materials science.

c. Structure of the lab

	-Electron microscope
	-Atomic probe field ion microscope
Director	-X-ray diffraction and morphology
	-Optical microscope
Associate	-NMR
	-EPR[1]
director	-Internal combustion supersonic decay I
	-Boliran scattering
	-Raman scattering[2]
Academic	-Optical properties
	-Magnetic susceptibility measurement[3]
committee	-Crystal growth and real time observation
	-Super crystal lattice of metal
	-Super crystal lattice of non-crystal semiconductor
	-Liquid crystal
	-Super fine particles
	-Theory of solids
	-Visiting researchers

CRYSTALLINE MATERIAL LAB

Director: Jiang Minhua
Head of academic committee: Jiang Minhua
Address: Jinan 250100, Shandong University
Phone: 46961-2449

This lab was among the first of the state key labs. The preparations of the lab started in 1984 and it formally opened in Nov., 1987.

a. Directions and goals of research

This lab is mainly engaged in studies of preparation and properties of thin film crystal material, including the basic process of crystal growth, studies of crystal physics and devices and exploration of crystal material with new functions.

(1) Study of basic process of crystal growth

This is the basis of growing crystal material with excellent functions. It includes: features of crystal growth and crystal structure, relationship between media and defect, kinetics of crystal growth (real-time observation and recording of growth process using holography and microscopic interference method), computer simulation of the process of crystal growth, probing mechanism and theory of growth. The emphasis of research is rapid growth of crystals in aqueous solution and study of growth of organic crystals under microgravity using interference holography.

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(2) Exploring crystal material with new functions

This area is the lab's emphasis. Novel, highly efficient functional crystals required by laser non-linear optics, iron electricity, thermal release electricity and pressure electricity

will be designed, synthesized and grown. They are mainly self multiple frequency and multiple function crystals for micro laser devices, high efficiency non-linear optical crystals (especially those for semiconductor laser multiple frequency), refraction crystals of high sensitivity, thermal release electricity crystals with large area homogeneous addition and high T_c and high J_c superconducting single crystals.

(3) Study of crystal physics and devices

As a bridge from quality determination to application of crystal material,the study includes crystal interactions, multi-function combined effect and its optimum choice, relationship between structure, composition and defect of crystals and its function and properties, study of new functional effect and new physical phenomenon of crystals and study of crystal functional devices. The short term emphasis is to work on basis, structure, second-order non-linear polarizability and absorption spectra, to carry out molecular engineering design, to search for high efficiency organic non-linear optical crystals, to study light wave travel in thin film crystals and relationship between nature of electron energy spectrum and structure, composition, valency interface and defect, to design optical cathode material and solar energy material, to search for methods of measuring refractive index of small crystals, second-order non-linear optical coefficients and phase matching properties and to study new non-linear optical device and photoelectric cells.

(4) Preparation and property study of thin film crystal material

This is the study of basic theory and techniques of thin film preparation and of device structural material. It includes study of growth of group III-V multiple semiconductor material and MOCVD superconducting material, growth of non-matching crystal lattice thin film material,study of rapid, high frequency and optical cathode structure material and study of new metalloorganic source.

SURFACE PHYSICS LAB

Director: Wang Dingsheng
Associate directors: Zhong Zhantian, Shen Dianhong
Head of academic committee: Xie Xide
Address: Beijing 100080, Physics Institute, Acad. Sci. China
Phone: 28913-428, 285315

This lab is among the first of the state key labs. The preparations started in 1984 and the lab passed the state exam and opened in Nov., 1987 (Please see this journal, Vol. 8, p. 474 (1988) for details-the editor).

LAB FOR SEMICONDUCTOR SUPER CRYSTAL LATTICE

Director: Zheng Houzhi
Associate director: Wang Zhaoping, Yu Lisheng
Head of academic committee: Huang Kun
Address: Beijing 100083, Semiconductor Institute, Acad. Sci. China
Phone: 288131-254

This lab was formally opened in April, 1989 as a state key lab.

Directions and goals of research

This lab puts the research emphasis on exploration and development of a new generation of solid state electronic devices and photoelectric cells. Using growth methods of molecular beam extension (MBE) and metalloorganic compound vapor deposition (MOCVD) which produce low dimension quantum structures such as ultra thin, and large area homogeneous super crystal lattices and multiple layer heterogeneous crystals, we will mainly conduct basic physics research in the quantum structure of semiconductor super crystal lattice. We will study new physical phenomena and

effect by which super lattice quantum structure is different from ordinary three dimensional solids and their potential applications. We will explore a new generation of super large capacity artificial intelligence computers and provide the necessary science and technology foundation for super large capacity optical communication and high speed processing of photoelectric information.

This lab combines with the major project of the National Science Foundation and Academy of Sciences of China titled "semiconductor super crystal micro structure" and mainly studies kinetics and electron structure of semiconductor super crystal lattice and quantum trap. We will also study transport processes of low dimension super crystal lattice systems, semiconductor super crystal lattice quantum traps, non-linear optical properties of super crystal lattice and multiple quantum trap structures, super crystal lattice physics of non-crystal semiconductors, technology for one dimensional quantum lines, semiconductor super crystal lattice, quantum trap photoelectric cells and its physics and study deep energy level in super crystal lattice quantum traps and MBE group III-V super crystal lattice micro structure material.

We hope this lab will become a base for the comprehensive study of basic physics of super crystal lattice quantum structure material and devices. We want to conduct physical studies throughout the process of material quality improvement and development of new material and devices to help thoroughly understand new material and new devices and to facilitate transformation of results of physics study into new material and devices.

APPLIED OPTICS LAB

Director: Mu Guoguang
Head of academic committee: Wang Daheng
Address: Changchun 130022, Changchun Institute of Optics and fine Mechanics, Acad. Sci. China
Phone: 884692-2661

Establishment of the lab was approved in June 1986 and it opened formally in Aug., 1987.

1. Directions and goals of research

This lab is engaged in basic and high-tech research of applied optics. Major directions are information science and technology in modern optics, especially probing, transport, transformation, processing, display and evaluation of optical information and optical calculation and optical processing of non-optical information.

2. Contents of research

(1) Optical design and image quality evaluation

We mainly study intelligent specialist systems, software systems, non-conventional optical systems and special optical system for optical design, as well as subjective and objective image quality evaluation and their unified theory.

(2) Optical super fine processing and measurement techniques

To study molding of non-spherical, asymmetrical optical surface and super fine turning techniques and their mechanism.

(3) Optical calculation technique

To study optical switch and logic, calculation methods and structures, optical internal connections, optical storage, technique for space optical modulation and computer overall

layout.

(4) Imaging spectral technique

To study real time or quasi-real time obtaining of object images and object spectra corresponding to each image unit, including special front-placed optical systems, new spectrometry, performance evaluation of array detector and mounting technique.

(5) Color, vision and robot vision

To study spectral radiation, advanced colorimetry, color vision and robot vision.

(6) Optical information processing, holography and interference technique

(7) Short wave optics

We mainly study directly-incident soft X-ray devices and systems, vacuum ultraviolet spectroscopy, special spectral techniques and standards for soft X-ray-vacuum ultraviolet radiation.

This is the only state key lab for applied optics.

(The committee of National Science Foundation,
division of mathematics and physics)

REFERENCES

1. Cooperated with Nanjing University modern analytical center.
2. Cooperated with Nanjing University modern analytical center.
3. Cooperated with Nanjing University modern analytical center.

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